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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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			EXAMINER ORLANDO, MICHAEL N	
			ART UNIT 1791	PAPER NUMBER
			NOTIFICATION DATE 04/29/2009	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary

Application No.

10/757,463

Applicant(s)

WANG, WEI-HONG

Examiner

MICHAEL N. ORLANDO

Art Unit

1791

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 January 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SG/US)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

The arguments and amendments submitted 01/26/2009 have been fully considered and the 112 issues are hereby withdrawn. The merits of the claims continue, however, to be unpatentable over the prior art as set forth below.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang (US 6,135,838) in view of the "Titanium dioxide photocatalysis" article, Taoda et al. (US 5,670,206), Yamada et al. (US 5,897,958) and further in view of Na et al. (US 6,576,589).

Wang discloses a method of making a lamp for air cleaning comprising: formulating a photocatalyst coating sol such as of anatase TiO_2 and dip coating a glass fiber cloth or sleeve with the sol; drying the coated cloth or sleeve to form a cloth or sleeve coated with anatase TiO_2 crystals; impregnating the cloth or sleeve with a solution of an oxidation catalyst comprising precious metals or transition metal oxides; drying again; wrapping the cloth around a lamp tube or slipping the sleeve on a lamp tube; and fixing the cloth or sleeve to the lamp by UV resistant glue or laser sintering (col. 3-9). Wang discloses that providing the sol on a glass fiber cloth or sleeve provides an increased surface area of photocatalysts and can allow waste gases in the air to diffuse readily in the photocatalytic active sites. Wang discloses providing the glass fiber cloth or sleeve on a UV lamp tube but does not disclose providing the cloth or sleeve on a fluorescent lamp tube. Wang discloses drying, baking and sintering the photocatalyst sol coated cloth or sleeve to produce a photocatalyst-coated glass fiber cloth or sleeve but does not specifically disclose that sol comprises nano crystalline anatase particles and that the photocatalyst after baking and sintering is nano-crystalline. Wang further discloses that the baking step is done in the range of 100-200 degrees.C. (column 3, lines 62-65). Since the baking step of Wang does not include a sintering step (the sintering step of Wang is separate step and not part of the baking step as presently claimed) the reference is taken to read on the claims.

"Titanium dioxide photocatalysis" article teaches that odors objectionable to humans are due to compounds present only on the order of 10 parts per million by volume and at these concentrations, the UV light available from ordinary fluorescent

lighting should be sufficient to decompose such compounds when TiO₂ photocatalysts are present (pg. 5).

Taoda et al. teach that a deodorizing lamp for decomposing malodorous substances can be made by providing TiO₂, such as from a sol solution, on the surface of lamps including incandescent lamp, fluorescent lamp, black-light lamp, UV lamp, mercury-vapor lamp, xenon flash lamp, halogen lamp and metal halide lamp, either of cylindrical, bulbous or some complicated shape. For enhancing the effectiveness of the deodorizing lamp, the lamp unit is desired to produce light with a large shortwave light component. The TiO₂ absorbs harmful UV light emitted from the light source and the light emitted from the lamp is easy on the eyes and safe for the human body and can therefore be used as a room lamp (col. 2, line 1-23, col. 4, lines 6-15).

Yamada et al. teach that in making photocatalyst from a titanium oxide sol, the sol contains crystalline particles of anatase type and having average particle size of from 1 to 300 nm dispersed in the sol because smaller than 1 nm and the wavelength range of light having interaction tends to be narrow while if larger than 300 nm, it tends to be difficult to obtain high activities. Yamada et al. teach drying and baking a sol having particles of average particle size of 20 to 30 nm to form a film having titanium oxide particles of average particle size of 30-40 nm (col. 4, line 64 - col. 5, line 6, col. 10, lines 10-40). Yamada et al. also teach that aqueous TiO₂ sol is stable only in pH range of not higher than 3 or not lower than 10 and teach using either acid or alkali to form the aqueous sol (col. 3, lines 8-12). Yamada also recognizes that anatase (i.e. the crystalline form) is generally considered to have higher effects than the amorphous form

(i.e. rutile) (column 2, lines 51-56). Also, Yamada discloses that catalytic activities are affected by the particle size as well (column 3, lines 1-2).

Na discloses that while traditional anatase production method involve a sintering process an alternative production method can be utilized which omits the need for sintering. Na discloses that the titanium starting materials can be suspended in an alcohol solvent along with other desired additives and then an acidic or basic solution can be added along with gentle heating (less than 100 degrees) to produce anatase nanoparticles of the desired size (columns 3 and 4).

It would have been obvious to one of ordinary skill in the art to have modified the method of Wang by using the process to form photocatalyst on a fluorescent lamp tube instead of a UV lamp tube in order to provide a lamp which can be used as a deodorizing lamp for decomposing malodorous substances and also as a lamp that can be used as a room lamp, as taught by Taoda et al. Fixing the cloth or sleeve on a fluorescent lamp tube would have been obvious to one of ordinary skill in the art because the "Titanium dioxide photocatalysis" article teaches that even fluorescent lighting provides sufficient UV light to decompose odors and Taoda et al. teach that lamps for decomposing odors and which can be provided with TiO₂ from a sol solution include not only UV lamps but also incandescent lamps, fluorescent lamps, black-light lamps, mercury-vapor lamps, xenon flash lamps, halogen lamps and metal halide lamps. The use of the sol as coated on a glass fiber cloth instead of directly on the lamps such as a fluorescent lamp would have been obvious to one of ordinary skill in

the art for the benefit of increased surface area of photocatalysts which allows gases in the air to diffuse readily in the photocatalytic active sites, as disclosed by Wang.

It would have been obvious to one of ordinary skill in the art to have further modified the method of Wang by providing the sol of nano crystalline anatase particles of size in the range of 1 to 300 nm (nano crystalline), as taught by Yamada et al. as useful particle size for particles in a sol for making photocatalyst because smaller than 1 nm and the wavelength range of light having interaction tends to be narrow while if larger than 300 nm, it tends to be difficult to obtain high activities. Baking and sintering the photocatalyst sol to form a photocatalyst coating that is nano crystalline would have been obvious to one of ordinary skill in the art because Yamada et al teach that the nano crystalline particles in the sol are dried and baked to for a photocatalyst film having particles of average particle size of 30-40 nm. Because Yamada et al. teach that when particle size is smaller than 1 nm, wavelength range of light having interaction tending to be narrow, while it tends to be difficult to obtain high activities if the size is larger than 300 nm, it would have been obvious to one of ordinary skill in the art to have dried, baked and sintered the sol to form a coating having nano crystalline particles of such size so as to have sufficiently high photocatalyst activity at sufficiently large wavelength range for interaction. Since Wang appreciates the need for titanium dioxide as a photocatalyst other art pertaining to the use of titanium dioxide as a photocatalyst would be relevant teachings. Yamada provides further insight and first off specifically denotes that the crystalline form, anatase, is generally accepted as being more active than the amorphous form, rutile. Yamada also denotes that particle size for such

titanium dioxide particles useful as photocatalysts has a direct effect on the catalytic activity (column 3, lines 1-2). Still further Yamada indicates that titanium oxide in the nano form (i.e. 1-100nm) is the preferred titanium oxide particle size that is ideal in both the amount of light allowed through and the activity (column 4, line 64 through column 5, line 6). There would have been ample motivation for an ordinary skilled artisan presented with the invention of Wang to look to the teachings of Yamada to achieve maximal catalytic activity.

As to the omission of the sintering step such would have been obvious in view of the teachings of Na as indicated above because such was known to negate the need for the sintering step whereby an ordinary skilled artisan would have been motivated to utilize such a process because such not only allows for the control of features such as dispersability, stability, particle size and surface properties (column 4, lines 23-25), but such also allows for the omission of previously required steps such as filtering, sintering and milling (column 2, lines 5-7) which would be expected to reduce cost (less heating and less machinery needed), complexity (less processing steps) and production time (less steps). The method of Wang involves a coated solution of titanium oxide which is dried (i.e. solvent removed) at temperatures of 100-200degrees. The incorporation of Na, a new advantageous production method, with the method of Wang would therefore also include the steps of coating and drying (since Na is still a coating and as set forth by Wang needs to be dried), but would not require the sintering process since the titanium dioxide would already be in the anatase form (i.e. would not need to be sintered to convert any rutile form).

Regarding Claim 1, the use of a thermal plastic ring belt or sewing would have been obvious to one of ordinary skill in the art as alternatives to UV resistant glue or laser sintering for fixing the cloth or sleeve to the lamp.

Regarding Claim 2, Wang discloses that the sol can contain organic and/or inorganic salts of other metals such as W, Zn, Sn and Fe and the sol is made of $Ti(OR)_4$ with alcohol solvent and amount of water.

Regarding Claim 3, Wang discloses that acids HCL and HNO_3 can be added to the TiO_2 sol to adjust the pH thereof to 1-3, thus using an acidic process to prepare the sol.

Regarding Claim 4, it would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined by preparing the TiO_2 sol in an alkaline process using an alkali, as taught by Yamada et al., as an alternative to using an acid. Using either an acid in an acid process to adjust the sol to pH of 1-3 or using an alkali to adjust the pH of the sol to greater than 10 would have been obvious to one of ordinary skill in the art as alternatives, as Yamada et al. teach that the sol is stable only at either pH less than 3 or greater than 10 which can be done by using either an acid or alkali.

Regarding Claim 5, Wang discloses that the substrates such as glass fiber cloth are transparent.

Regarding Claim 6, Wang discloses that the sol coating on the cloth results in chemical bonding such that the coating does not peel easily from the cloth (col. 12, lines 42-47).

Regarding Claim 7, as to the particles being nanoparticles for the oxidation catalysts. Wang discloses the use of oxidative catalysts of nano-sized precious metals in the elemental state of nano-sized transition metal-oxides (column 4, lines 1-9; column 7, lines 5-10). The nano-size of the oxidation catalysts is evidenced by the fact that Wang discloses that the oxidation catalysts are absorbed into the mesopores of the fiber (column 7, lines 25-30). A mesopore is defined as a small pore with a diameter between 2 and 50nm. Since the pores are nano-sized and the catalysts need to be absorbed into such pores they must either be at least smaller than 50nm and therefore Wang clearly appreciates that such small particles as an nano-sized particles are suitable for use because they must be sufficiently small to be absorbed into the mesopores. The combination of the oxidation catalysts and photocatalyst into one step is a matter of obviousness that produces the expected result of decreasing the manufacturing time. The courts have held that simultaneous steps are obvious over successive steps in similar processes (*New Wrinkle v. Marzall* 93 USPQ 92, *New Wrinkle v. Watson* 96 USPQ 436). The combination would have been accomplished with predictable success because as set forth by Wang the oxidative catalysts, while able to be absorbed into the micropores of the previously applied photocatalyst coating, can also be absorbed into the mesopores of the fiber and therefore a substantial amount of the oxidation catalyst would be expected to be still be absorbed onto the fiber directly through the mesopores even without the absorption into the aforementioned micropores (column 7, lines 21-30). The motivation to combine the coating steps into

one rather than two separate steps would have been to produce the product with better efficiency (i.e. less time to manufacture).

Regarding Claim 8, Wang discloses that the oxidation catalyst can be Pd, Pt, Au or Ag precious metal salt solution such that the amount of oxidation catalyst in the photocatalyst is 0-10 wt%.

Regarding Claim 9, Wang discloses that the sol can contain organic and/or inorganic salts of other metals such as W, Zn, Sn and Fe in amount of 1-100% of the TiO₂ and the oxidation catalyst can be Mo, Nb, V, Ce or Cr transition metal salt solution such that the amount of oxidation catalyst in the photocatalyst is 0-10 wt%.

Regarding Claim 10, Wang discloses wrapping the cloth around a lamp tube or slipping the sleeve on a lamp tube.

Regarding Claims 11 and 12, it would have been obvious to one of ordinary skill in the art to have used a fluorescent lamp which emits visible light as well as a small amount of 365nm UV light and 405nm near UV light in order to provide UV light sufficient to decompose odors, as taught by the "Titanium dioxide photocatalysis" article and well as provide light that is easy on the eyes and safe for the human body and can therefore be used as a room lamp, as taught by Taoda et al.

4. Claim 11 is alternatively rejected under 35 U.S.C. 103(a) as being unpatentable over the references applied to claim 1 above and further in view of Ichikawa et al. (US 6,024,929).

Wang disclose including iron oxide photocatalyst with the TiO₂ photocatalyst.

Ichikawa et al. teach that fluorescent lamps emit light in the wavelength range of 290 nm - 750nm and for deodorizing, TiO₂ absorbs the UV light of wavelength 365 nm while iron oxide photocatalyst absorbs visible light of 405 nm and 436 nm wavelengths and is excited by the absorbed light (col. 7, lines 66-67, col. 8, lines 42-55, col. 11, lines 4-9).

By providing the photocatalyst-coated glass fiber cloth or sleeve on a fluorescent lamp, a lamp that emits visible light in the range of 420-700nm wavelength is obviously provided, as Ichikawa et al. teach that fluorescent lamps emit light in the wavelength range 290 nm - 750nm. Allowing the lamp to emit a small amount of light of wavelengths of 365 nm and 405 nm would have been obvious to one of ordinary skill in the art to provide UV light for absorption by the TiO₂ photocatalyst and light for absorption by the iron oxide photocatalyst for deodorizing, as taught by Ichikawa et al.

Response to Arguments

Applicant's arguments filed 08/28/2008 have been fully considered but they are not persuasive.

The applicant contends that the anatase nano-crystalline particles would not have been an obvious choice in view of the cited prior art.

The examiner disagrees and notes that Wang appreciates the need for the titanium dioxide sol to act as a photocatalyst. Since Wang appreciates the need for titanium dioxide as a photocatalyst other art pertaining to the use of titanium dioxide as a photocatalyst would be relevant teachings. Yamada provides further insight and first

off specifically denotes that the crystalline form, anatase, is generally accepted as being more active than the amorphous form, rutile. Yamada also denotes that particle size for such titanium dioxide particles useful as photocatalysts has a direct effect on the catalytic activity (column 3, lines 1-2). Still further Yamada indicates that titanium oxide in the nano form (i.e. 1-100nm) is the preferred titanium oxide particle size that is ideal in both the amount of light allowed through and the activity (column 4, line 64 through column 5, line 6). There would have been ample motivation for an ordinary skilled artisan presented with the invention of Wang to look to the teachings of Yamada to achieve maximal catalytic activity. As for the application in Yamada (i.e. a film) such is moot point because it is the highly catalytic titanium dioxide variation which is being incorporated into the method of Wang to replace the generic, less catalytic, photocatalyst. Further in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

The applicant cites the need for high temperature baking with different particle sizes.

Firstly, it is noted that the features upon which applicant relies (i.e., lower needed baking temperature) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Secondly, in response to applicant's argument that the particle size affects the necessary baking temperature, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). Given the nature of the prior art there would have been ample motivation to make the combination in order to increase the catalytic activity of the generic titanium dioxide of Wang.

Response to Arguments

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

The newly included merits have been addressed above. As indicated above the claims are still subject to the original rejection. The current claims require that the baking step be absent a sintering process which is still consistent with the teachings of Wang. Perhaps the applicant intended the claims to indicate that the product as a whole is only heated to a maximum temperature of 100-250 whereby any further heating and or sintering is omitted. The applicant should reword the claims to delineate the baking and omitted sintering steps so as to more accurately reflect the disclosure in the specification. It appears the applicant's invention can be made to be photocatalytic merely by drying and without a sintering step and if this is the case the omission of the sintering step should be delineated from the baking step and positively recited as its own step. Also, note that Na, as relied upon above, seems to indicate that anatase,

while traditionally formed by hydrolyzing, precipitating and sintering can also be formed by utilizing an alcohol solvent and pH titration under gentle heat in order to omit the need for sintering. It appears the presently claimed invention is merely a combination of the general method of Wang whereby the newer (more up to date) anatase production method of Na that omits sintering is being substituted as an alternative.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **MICHAEL N. ORLANDO** whose telephone number is

(571)270-5038. The examiner can normally be reached on Monday-Thursday, 7:30am-4:30pm, alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Philip C. Tucker can be reached on (571) 272-1095. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MO

/Philip C Tucker/
Supervisory Patent Examiner, Art Unit 1791